

**What is Claimed is:**

- Sub 1
1. A method for processing a substrate, comprising:  
providing a substrate with feature definitions formed in a dielectric material;  
depositing a barrier layer material on a substrate surface and in the feature definitions;  
depositing a first conductive material on the barrier layer material to fill the feature definitions;  
polishing the first conductive material to at least a top surface of the barrier layer material;  
depositing a second conductive material by an electrochemical deposition technique on at least the first conductive material to fill recesses formed in the first conductive material; and  
polishing the second conductive material and the barrier layer material to at least a top surface of the dielectric layer to form a planar surface.
  2. The method of claim 1, wherein the conductive material comprises copper, aluminum, tungsten, or combinations thereof.
  3. The method of claim 1, wherein the second conductive material comprises a noble metal, a semi-noble metal, a group IVA metal, or combinations thereof.
  4. The method of claim 3, wherein the second conductive material is selected from the group of copper, platinum, nickel, tin, cobalt, palladium, gold, silver, osmium, iridium, rhenium, ruthenium, tungsten, and combinations thereof.
  5. The method of claim 1, wherein the electrochemical deposition technique comprises an electroplating deposition technique, an electroless deposition technique, or an electrochemical mechanical plating process technique.
  6. The method of claim 1, wherein the second conductive material is deposited to a thickness between about 25 Å and about 2000 Å.

7. The method of claim 1, further comprising depositing a conductive seed layer on the barrier layer material by a chemical vapor deposition technique or a physical vapor definition technique prior to depositing the first conductive material.

8. The method of claim 1, further comprising annealing the substrate.

9. The method of claim 1, further comprising rinsing the substrate after each polishing process.

10. The method of claim 1, wherein polishing the first conductive material, depositing the second conductive material, and polishing the second conductive material and the barrier layer material are performed in the same polishing system.

11. The method of claim 1, wherein depositing the second conductive material and polishing the second conductive material and the barrier layer material are performed concurrently.

12. A method for planarizing a substrate surface, comprising:

providing a substrate to a polishing station disposed on a processing system, wherein the substrate comprises a dielectric material with substrate feature definitions formed therein, a barrier layer material disposed thereon and within the feature definitions, and a copper material disposed on the barrier layer material;

polishing a copper material from the substrate surface to at least a top surface of the barrier layer material;

transferring the substrate to an electrochemical deposition and polishing station disposed on the polishing system;

depositing a conductive material selectively on the copper containing material by an electroless deposition technique while removing the conductive material and the barrier layer material to at least a top surface of the dielectric layer by a polishing technique.

13. The method of claim 12, wherein the conductive material is deposited to a thickness between about 25 Å and about 2000 Å.

5/28/01  
14. The method of claim 12, wherein the conductive material is selected from the group of a noble metal, a semi-noble metal, a group IVA metal, and combinations thereof.

15. The method of claim 14, wherein the conductive material is selected from the group of copper, platinum, nickel, tin, cobalt, palladium, gold, silver, osmium, iridium, rhenium, ruthenium, tungsten, and combinations thereof.

16. The method of claim 12, further comprising annealing the substrate after polishing the second conductive material and the barrier layer material to the top surface of the dielectric layer.

17. The method of claim 12, further comprising rinsing the substrate after each polishing process.

18. A processing system for forming a planarized layer on a substrate, comprising:  
a processing platform having two or more processing stations, a loading station, and a substrate transfer device disposed above the processing stations and the loading station;

wherein at least one of the processing stations is adapted to polish a substrate surface;

wherein at least one of the processing stations is adapted to deposit a material by an electrochemical process; and

a computer based controller configured to cause the system to polish a first conductive material from the substrate surface to a barrier layer material, deposit a second conductive material on the first conductive material by an electrochemical deposition technique, and polish the second conductive material and the barrier layer material to at least the top surface of a dielectric layer.

19. The processing system of claim 18, wherein the computer based controller is further configured to cause the system to perform an electroplating deposition technique, an electroless deposition technique, or an electrochemical mechanical

plating process technique at the two or more processing stations adapted to deposit a material by an electrochemical process.

20. The processing system of claim 18, wherein the computer based controller is further configured to cause the system to deposit the patching material to a thickness between about 25 Å and about 2000 Å.

21. The processing system of claim 18, wherein the computer based controller is configured to cause the system to deposit a second conductive material on the first conductive material by an electrochemical deposition technique and polish the second conductive material and the barrier layer material to a top surface of the dielectric layer concurrently at the same processing station.

22. A substrate processing chamber adapted for processing a substrate comprising:

a substrate support, comprising:

a substrate receiving surface;

a vacuum port;

vacuum grooves in communication with the vacuum port; and

a fluid source;

a fluid input coupled to the fluid source and adapted to deliver a processing fluid to a substrate disposed on the substrate receiving surface; and

a fluid output adapted to drain the processing fluid from the processing chamber.

23. The substrate processing chamber of claim 22, wherein the substrate support further comprises a heater adapted to heat a substrate disposed on the substrate receiving surface.

24. The substrate processing chamber of claim 22, wherein the substrate support is adapted for face-up processing.

- Sub 1
25. The substrate processing chamber of claim 22, wherein the fluid input comprises at least one nozzle adapted to be positioned above the substrate support.
26. The substrate processing chamber of claim 22, wherein the substrate support is adapted to rotate.
27. The substrate processing chamber of claim 22, further comprising a polishing head assembly comprising:  
polishing media; and  
a polishing media support.
28. The substrate processing chamber of claim 27, further comprising an electrode contacting the polishing media or the polishing media support.
29. The substrate processing chamber of claim 28, further comprising a spacer disposed between the electrode and the polishing media.
30. The substrate processing chamber of claim 27, wherein the polishing media comprises a conductive polishing media.
31. The substrate processing chamber of claim 27, wherein the polishing head assembly is adapted to rotate.
32. The substrate processing chamber of claim 27, wherein the polishing head assembly has a smaller diameter than the substrate diameter.
33. An electrochemical deposition system, comprising:  
a mainframe having a mainframe wafer transfer robot;  
a loading station disposed in connection with the mainframe;  
one or more electrochemical processing cells disposed in connection with the mainframe, the one or more electrochemical processing cells comprising:  
a substrate support, comprising:  
a substrate receiving surface;

2b01

a vacuum port;  
vacuum grooves in communication with the vacuum port; and  
a fluid input coupled to an electrolyte supply and adapted to deliver an electrolyte to a substrate disposed on the substrate receiving surface; and  
a fluid output adapted to drain the processing fluid from the processing chamber;  
one or more polishing platens disposed in connection with the mainframe;  
an electrolyte supply fluidly connected to the one or more electrochemical processing cells; and  
one or more polishing fluid supplies connected to the one or more polishing platens.

34. The system of claim 33, further comprising a polishing head assembly disposed adjacent the one or more electrochemical processing cell and comprising:

polishing media; and  
a polishing media support

35. The system of claim 34, further comprising an electrode contacting the polishing media or the polishing media support.

36. The system of claim 34, further comprising a spacer disposed between the electrode and the polishing media.

37. The system of claim 33, further comprising a system controller for controlling an electrochemical deposition process, an electrochemical removal process, a polishing process, or combinations thereof.

38. The system of claim 33, further comprising a spin-rinse-dry (SRD) station disposed between the loading station and the mainframe.

39. The system of claim 33, further comprising a thermal anneal chamber disposed in connection with the loading station.